

IN THE UNITED STATES DISTRICT COURT
FOR THE MIDDLE DISTRICT OF NORTH CAROLINA

THE TRUSTEES OF PURDUE)	
UNIVERSITY,)	
)	
Plaintiff,)	
)	
v.)	1:21-cv-840
)	
WOLFSPEED, INC.,)	
)	
Defendant.)	

SUPPLEMENTAL CLAIM CONSTRUCTION MEMORANDUM OPINION AND ORDER

This court has separately addressed claim construction of terms in U.S. Patent No. 7,498,633 ("the '633 Patent"). (Doc. 163.) On May 5, 2023, this court held a claim construction hearing with the parties – Plaintiff, the Trustees of Purdue University, and Defendant, Wolfspeed, Inc. – at which time this court took the matter under advisement. (Minute Entry 05/05/2023.) During briefing and the claim construction hearing, Defendant raised a concern about the '633 Patent's guidance, or lack thereof, concerning where the JFET region's width is measured. Consequently, this court requested, (Doc. 164), and received, (Docs. 167, 175 (Plaintiff); Docs. 168, 174 (Defendant)), supplemental briefing on this discrete issue. For the reasons set forth herein, this court will assume without deciding that the claim terms are definite and defer

consideration of Defendant's indefiniteness argument as to the below-listed claim terms to a later stage in these proceedings following further findings of fact and expert discovery.

Claim Term	Plaintiff's Construction	Defendant's Construction
"the JFET region having a width less than about three micrometers" (Claim 9)	No construction necessary	Indefinite
"the JFET region having a width of about one micrometer" (Claim 10, depends from Claim 9)	No construction necessary	Indefinite

I. BRIEF OVERVIEW OF THE '633 PATENT

At issue here is the '633 Patent, entitled "High-Voltage Power Semiconductor Device." ('633 Patent (Doc. 83-1) at 2.)¹ The '633 Patent claims particular double-implanted MOSFETS, which – at a high level – act like electric switches allowing or preventing current to flow from an electrode source to a drain. A MOSFET device switches and regulates current in electric circuits by creating static electronic fields in a semiconductor material. (See Ex. 1, Expert Report of W. Allen Doolittle, Ph.D. Concerning Construction of Certain Terms in U.S. Patent No.

¹ All citations in this Memorandum Opinion and Order to documents filed with the court refer to the page numbers located at the bottom right-hand corner of the documents as they appear on CM/ECF.

7,498,633 ("Doolittle Report") (Doc. 104-1) at 13.) A vertical MOSFET device consists of several layers: the gate electrode, gate oxide, source electrodes, a series of semiconductor drift layers of differing polarities, and a lower drain layer. (Id. at 14.) Current flows through a channel in the drift layer from the source to the drain. (See id.) Applying a static electric field transverse to the current flow creates a "field effect" that impacts the conductance of a semiconductor device. (See id. at 13.)

When a MOSFET device is in the on-state, an electric field forms across the oxide layer of the device and permeates into the semiconductor; this creates a channel in which electrons flow from the source region through the drift layer of the device and into the drain terminal. (Id. at 15.) In the off-state, there is a high resistance in the drift layer that blocks voltage applied to the MOSFET device. (See id. at 15-16.) In a MOSFET device, a JFET region is formed from the "pinch[ing] [of] current flow from source to drain" (Id. at 17.) The pinching action increases the device's resistance. (Id.)

A major "design consideration" in MOSFET devices appears to be balancing a "high blocking voltage" with a low "on-resistance of the semiconductor device" because a decreased on-resistance improves the semiconductor device's efficiency. ('633 Patent

(Doc. 83-1) at 7.) "However, the typical fabrication techniques for reducing the specific on-resistance of high-voltage power semiconductor devices may also reduce the blocking voltage of the device." (Id.) "One technique to minimize the JFET component on-state resistance involve[s] widening the JFET region and thereby reducing the degree of pinching." (Doolittle Report (Doc. 104-1) at 18.) However, "[t]hat approach ha[s] drawbacks" because "it increase[s] the cell size of the device" and "compromise[s] blocking voltage." (Id.) Relatedly, "a JFET region that [is] too wide would result in the field across the gate oxide in the blocking state to exceed the electric field for oxide breakdown, thus damaging the gate oxide." (Ex. 2, Expert Report of Stanley Shanfield, Ph.D. ("Shanfield Report") (Doc. 103-2) at 17.) "[T]he field in the oxide [must] remain below a critical value to avoid early failure of the oxide during operation in the field. . . . [I]n practice[,], the oxide field must be kept below about 3 MV/cm." (Id.)

"[T]here are a number of well-known design considerations and variables that influence the design of a JFET region." (Doolittle Report (Doc. 104-1) at 19.) For example, "reducing one component of on-state resistance might increase another," as "reducing . . . the JFET width might also reduce the channel length and thereby reduce the channel component of on-state

resistance," which "could counteract the increase in JFET resistance." (Id.)

Blocking voltage and on-resistance appear to be inversely correlated, where both a high blocking voltage and a low on-resistance are desirable. A "JFET region that was too wide would result in the field across the gate oxide in the blocking state to exceed the electric field for oxide breakdown, thus damaging the gate oxide." (Shanfield Report (Doc. 103-2) at 17.) "On the other hand, a JFET region that was too narrow would increase the on-state resistance, contrary to the design goal" of the MOSFET device. (Id. at 17-18.) "[T]here is an optimum width at which one achieves the lowest on-resistance without allowing the oxide field to exceed the electric field for oxide breakdown in the blocking state." (Id. at 18.) The '633 Patent claims MOSFET devices in which "the JFET region [has] a width less than about three micrometers" and devices in which "the JFET region has a width of about one micrometer." ('633 Patent (Doc. 83-1) at 11.)

II. LEGAL STANDARD

In Markman v. Westview Instruments, Inc., 517 U.S. 370 (1996), the Supreme Court clarified which issues in a patent trial are properly reserved for the jury and which are questions of law to be determined by the court. Specifically, the Court held that interpretation of language in patent claims "is an

issue for the judge, not the jury[.]” Id. at 391. The Federal Circuit has provided further guidance on how to interpret patent claims, stating that, in general, courts are to give the words of a claim “their ordinary and customary meaning” as understood by “a person of ordinary skill in the art in question at the time of the invention[.]” Phillips v. AWH Corp., 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc) (citations omitted).

Separate from but related to claim construction is the issue of patent invalidity for indefiniteness. A patent claim is invalid for indefiniteness under 35 U.S.C. § 112 “if [the] claim[], read in light of the specification delineating the patent, and the prosecution history, fail[s] to inform, with reasonable certainty, those skilled in the art about the scope of the invention.” Nautilus, Inc. v. Biosig Instruments, Inc., 572 U.S. 898, 901 (2014). Determining invalidity is a legal question for the court to evaluate. Young v. Lumenis, Inc., 492 F.3d 1336, 1344 (Fed. Cir. 2007) (“A determination that a patent claim is invalid for failing to meet the definiteness requirement in 35 U.S.C. § 112 . . . is a legal question reviewed de novo.”). “The definiteness requirement must take into account the inherent limitations of language, but at the same time, the patent must be precise enough to afford clear notice of what is claimed, thereby apprising the public of what

is still open to them.” Fairfield Indus., Inc. v. Wireless Seismic, Inc., No. 4:14-CV-2972, 2015 WL 1034275, at *4 (S.D. Tex. Mar. 10, 2015) (citing Nautilus, 572 U.S. at 907-11). “The definiteness requirement ‘mandates clarity, while recognizing that absolute precision is unattainable.’” Presidio Components, Inc. v. Am. Tech. Ceramics Corp., 875 F.3d 1369, 1375 (Fed. Cir. 2017) (quoting Nautilus, 572 U.S. at 910). Patents are presumed to be valid, and the patent challenger has the burden of proving invalidity by clear and convincing evidence. See Microsoft Corp. v. I4I Ltd. P’ship, 564 U.S. 91, 95 (2011); Takeda Pharm. Co. v. Zydus Pharms. USA, Inc., 743 F.3d 1359, 1366 (Fed. Cir. 2014), cert. denied, 574 U.S. 1026 (2014).

III. ANALYSIS

Defendant argues that the ‘633 Patent fails to specify where the JFET region’s width, which varies due to the curvature of the p-well boundaries, should be measured. (Def.’s Opening Claim Construction Br. (Doc. 104) at 23-24; Def.’s Suppl. Claim Construction Br. (Doc. 168) at 4.) Defendant contends that a given MOSFET device may fall within or outside the scope of the ‘633 Patent depending on where the JFET region’s width is measured, creating an ambiguity rendering the two claim terms at issue here indefinite. (Def.’s Opening Claim Construction Br.

(Doc. 104) at 24, 26; Def.'s Suppl. Claim Construction Br. (Doc. 168) at 5.)

Plaintiff refutes this argument, explaining that "the JFET region should be measured at the narrowest point to achieve the intended design." (Pl.'s Responsive Claim Construction Br. (Doc. 117) at 9.) Plaintiff contends a person of skill in the art would know there is an optimum width that furthers the MOSFET device's design goal of "achiev[ing] the lowest possible on-resistance while meeting the desired blocking voltage specification." (Id. (quoting Shanfield Report (Doc. 103-2) at 17-18); see also Pl.'s Suppl. Claim Construction Br. (Doc. 167) at 8 ("[O]nly one optimum width exists at the intersection of these design considerations – the width at the narrowest distance in an operating device").) In subsequent briefing, Plaintiff adds that "Figure 1 [of the specification] shows that the JFET width (designated as item '36') is the width

between the vertical edges of the P wells, i.e., its narrowest width.” (Pl.’s Suppl. Claim Construction Br. (Doc. 167) at 3.)²

When a claim term calls for a measurement value, but the claim or specification fails to specify how that measurement should be performed, the claim term may be indefinite. See Teva Pharms. USA, Inc. v. Sandoz, Inc., 789 F.3d 1335, 1340-45 (Fed. Cir. 2015); Frans Nooren Afdichtingssystemen B.V. v. Stopag Amcorr Inc., 744 F.3d 715, 724 (Fed. Cir. 2014). If the specification provides sufficient guidance on performing the measurement or if the differences between alternative measurement methods are not material, then the patent does not

² Plaintiff also adds in its supplemental briefing that “under Federal Circuit law, the claims’ use of ‘a width’ contemplates that the JFET region could have ‘one or more’ widths of less than about three micrometers (or about one micrometer),” meaning that “infringement lies if any one of those JFET region widths falls within the scope of the claims.” (Pl.’s Suppl. Claim Construction Br. (Doc. 167) at 2-3 (citing Baldwin Graphic Sys., Inc. v. Siebert, Inc., 512 F.3d 1338, 1342 (Fed. Cir. 2008).) This argument was not raised prior to the court’s issuance of its Claim Construction Memorandum Opinion and Order, (Doc. 163), and is contrary to both that Order and arguments raised at the claim construction hearing, therefore the court will not consider it at this time. See Fenner Inv., Ltd. v. Microsoft Corp., 632 F. Supp. 2d 627, 638 (E.D. Tex. 2009), aff’d 369 F. App’x 132 (Fed. Cir. Mar. 15, 2010) (“[N]o party should be allowed to argue to the jury claim constructions that are contrary to the court’s claim constructions’ Because this argument is contrary to the claim construction order and was not raised prior to . . . the claim construction hearing it is waived.” (quoting Transamerica Life Ins. Co. v. Lincoln Nat. Life Ins. Co., No. C 06-110-MWB, 2009 WL 88357, at *9 (N.D. Iowa Jan. 8, 2009).

need to provide those details to be considered sufficiently definite. Ethicon Endo-Surgery, Inc. v. Covidien, Inc., 796 F.3d 1312, 1315-22 (Fed. Cir. 2015); Takeda Pharm. Co., 743 F.3d at 1366-67. "[A] claim is not indefinite if a person of skill in the art would know how to utilize a standard measurement method . . . to make the necessary measurement." Presidio Components, Inc., 875 F.3d at 1376. "A patent need not explicitly include information that is already well known in the art." Id. (citing Nautilus, Inc., 572 U.S. at 906). Even if there is no industry standard for a measurement, if the specification provides guidance on a certain measurement, that patent claim may be sufficiently definite. See id. (citing Ethicon Endo-Surgery, Inc. v. Covidien, Inc., 796 F.3d 1312, 1317-19 (Fed. Cir. 2015)).

In Presidio Components, Inc., the allegedly indefinite claim at issue concerned "multilayer capacitors with a fringe-effect capacitance between external contacts that [were] 'capable of being determined by measurement in terms of a standard unit.'" Id. at 1375 (quoting U.S. Patent No. 6,816,356). The patent and specification discussed using insertion loss testing as a method for measuring capacitance; however, this method was "not well known as a method to measure the comparative contributions from different capacitances within

the multilayer capacitor," nor did "the patent specification describe how to apply the insertion loss method to determine the portion of the overall capacitance that is attributable to the fringe-effect capacitance." Id. at 1376. That is, insertion loss testing was discussed in the patent and the specification, but it was not an industry-standard measurement technique. Id. The Federal Circuit found the claim term sufficiently definite because the patent referenced a methodology for performing the measurement and because "the general approach of making modifications to a capacitor to isolate the impact of discrete capacitances was within the knowledge of someone skilled in the art." Id. at 1377. The Federal Circuit further explained:

the claims do not require that fringe-effect capacitance exist at any particular level; they only require that it be capable of measurement in terms of a standard unit. To be sure, even where the claims require a particular test result, there may be (and often are) disputes between the parties as to the proper application of the test methodology in the circumstances of an individual case. But those disputes are disputes about whether there is infringement, not disputes about whether the patent claims are indefinite. Here, the general approach was sufficiently well established in the art and referenced in the patent to render the claims not indefinite. The claims do not rely on the unpredictable vagaries of any one person's opinion.

Id. (internal quotation marks and citation omitted).

In contrast, in Saso Golf, Inc. v. Nike, Inc., 843 F. App'x 291 (Fed. Cir. 2021), the Federal Circuit affirmed a district

court's finding that a claim term concerning the precise boundaries of the toe and heel of a golf club was indefinite. Id. at 295. The district court made a factual finding that "an artisan would not know the precise bounds of the toe and heel of a golf club." Id. at 294. This finding was based on expert testimony that persons of skill in the art "did not consider the terms 'toe' and 'heel' to have a single definition," and the patent or record failed to provide guidance on the measurement, so those persons "would not be able to choose a point related to the toe and heel from which to measure" Id. at 295. Consequently, the district court found the claim term indefinite. Id. The Federal Circuit affirmed both the district court's factual finding and its ultimate determination that the claim was indefinite. Id. at 295-96. The Federal Circuit also explained that only the defendant provided non-conclusory expert testimony concerning the issue of the toe and heel boundaries, whereas the plaintiff's expert did not provide testimony on this issue. Id.

Here, Plaintiff argues that a person of ordinary skill in the art ("POSITA") would know the JFET region's width "should be measured at the narrowest point to achieve the intended design." (Pl.'s Responsive Claim Construction Br. (Doc. 117) at 9; Pl.'s Suppl. Claim Construction Br. (Doc. 167) at 2 ("A [POSITA] would

readily understand how and where to measure the claimed JFET 'width' given the plain terms of the specification and basic semiconductor fundamentals.".) Plaintiff's expert, Dr. Shanfield, explains that "a POSITA would understand that a JFET region that was too wide would . . . damage[e] the gate oxide," while a "JFET region that was too narrow would increase the on-state resistance, contrary to the design goal."

(Shanfield Report (Doc. 103-2) at 17-18.) Dr. Shanfield further explains: "A POSITA would know the design criteria of JFET-region width generally and from published literature." (Id. at 18.) Thus, "a POSITA would readily understand the scope of the [disputed] term[s] with reasonable certainty." (Id. at 18-19.)

On the other hand, Dr. Doolittle, on behalf of Defendant, opines that "the claims and specification of the '633 Patent . . . fail to specify where along the boundary of the JFET region the claimed width measurements should be taken." (Doolittle Report (Doc. 104-1) at 29.) At most, in Figure 1, notation 36 illustrates the width of the JFET region. ('633 Patent (Doc. 83-1) at 2; id. at 9 ("the shorter width 36 of the JFET region"); id. ("As such, the design process of the semiconductor device 10 may include a number of reiterative steps of selecting a width 36 . . . for the JFET region.").)

Dr. Doolittle explains that the p-wells have "a generally curved profile." (Doolittle Report (Doc. 104-1) at 30.) Figure 1 shows curvature along the JFET region. ('633 Patent (Doc. 83-1) at 2.) Given this curvature, Dr. Doolittle continues:

the choice of measurement location is meaningful in terms of determining whether a given MOSFET device falls within the scope of the claims. For example, . . . if the JFET region is defined between the lower portion of the p wells, then the region has a width of 4 micrometers and falls outside the scope of claim 9. If the JFET region is defined between [the] upper portion of the p wells, then the region has a width of 2.9 micrometers and falls within the scope of the claim.

(Doolittle Report (Doc. 104-1) at 31.) "The patent is silent about whether [the curved] portions [of the p-wells] should be included in the width measurement of the JFET region." (Id. at 32.) "The specification likewise identifies the width of the JFET region as item 36 in Figure 1 but does not explain how to measure the width relative to the non-uniform edges of the p wells." (Id.)

The '633 Patent, unlike the patent at issue in Presidio Components, requires the JFET width to "exist at [a] particular level" as specified in the two claim terms at issue here. See 875 F.3d at 1376. The parties' experts dispute whether the '633 Patent provides sufficient guidance to a person of skill in the relevant art on measuring the JFET region's width. Dr. Doolittle, on behalf of Defendant, opines that the Patent

"do[es] not inform a person of ordinary skill in the art how the width of the JFET region should be measured relative to the boundary of the p well (or n source region)." (Doolittle Report (Doc. 104-1) at 32.) Although Dr. Shanfield, on behalf of Plaintiff, does not appear to address how or where the JFET region's width should be measured, he conclusively explains that "a POSITA would know the design criteria of JFET-region width generally." (Shanfield Report (Doc. 103-2) at 18.) The opposing expert opinions have created an issue of fact as to indefiniteness. Specifically, this creates an issue of fact as to whether a POSITA would "know the design criteria of JFET-region width generally," (see id.), and whether that generally-known design criteria provides a standard means of measurement.

"Indefiniteness is a matter of claim construction, and the same principles that generally govern claim construction are applicable to determining whether allegedly indefinite claim language is subject to construction." Praxair, Inc. v. ATMI, Inc., 543 F.3d 1306, 1319 (Fed. Cir. 2008); see also Energizer Holdings, Inc. v. Int'l Trade Comm'n, 435 F.3d 1366, 1368 (Fed. Cir. 2006) ("An analysis of claim indefiniteness . . . is 'inextricably intertwined with claim construction.'"") (quoting Atmel Corp. v. Info. Storage Devices, Inc., 198 F.3d 1374, 1379 (Fed. Cir. 1999)). However, there are "[s]everal well-settled

principles . . . [that] tend to discourage rulings on indefiniteness at the [claim construction] stage.” See CSB-Sys. Int’l Inc. v. SAP Am., Inc., No. 10-2156, 2011 WL 3240838, at *17 (E.D. Pa. July 28, 2011). First, indefiniteness is an invalidity defense, and the patent challenger bears the burden of proving invalidity by clear and convincing evidence. See Microsoft Corp., 564 U.S. at 95; Takeda Pharm. Co., 743 F.3d at 1366. “Second, and more importantly, while claim construction proceedings give meaning to claim terms, ‘indefiniteness invalidates the claims entirely.’” DuraSystems Barriers Inc. v. Van-Packer Co., No. 19-cv-01388, 2021 WL 4037826, at *6 (C.D. Ill. Sept. 3, 2021) (citations omitted).

Accordingly, district courts may decline to resolve issues of indefiniteness during the claim construction stage of litigation. See, e.g., Junker v. Med. Components, Inc., No. 13-4606, 2017 WL 4922291, at *2 (E.D. Pa. Oct. 31, 2017) (“[D]istrict courts throughout the country have generally been reluctant to consider whether a patent is indefinite at the claim construction phase, rather than at the summary judgment phase.”); Gilead Scis., Inc. v. Mylan Inc., No. 14CV99, 2015 WL 1534067, at *2 (N.D. W. Va. Apr. 6, 2015) (“[M]any judges have elected to wait and tackle indefiniteness at the summary judgment stage” due to “the high burden of proof on the party

challenging a patent claim for indefiniteness," "the fact that a claim is not indefinite merely because the parties dispute its meaning," and "the dispositive effect of a ruling on indefiniteness."); DuraSystems Barriers Inc., 2021 WL 4037826, at *7 ("Given these raised stakes (along with the raised burden on indefiniteness), the Court sees little harm in waiting until it has a fuller picture of this case to make them. This means waiting until the parties have produced a complete discovery record at the summary judgment stage.").

"When a claim is asserted to be indefinite because it has no meaning to a person skilled in the art, an indefiniteness decision at the claim construction stage may be practically unavoidable. But in other situations, the issues may not be as closely dependent on each other, and therefore an indefiniteness decision will be better left for decision at summary judgment, on a more developed record." Cipher Pharms. Inc. v. Actavis Laboratories FL, Inc., 99 F. Supp. 3d 508, 514 (D.N.J. 2015). "[T]he mere fact that claim construction is a necessary prerequisite to determining whether a claim is indefinite does not, by itself, compel a court undertaking claim construction, under Markman, to address the question of invalidity due to indefiniteness." East Coast Sheet Metal Fabricating Corp. v. Autodesk, Inc., No. 12-cv-517, 2014 WL 2879755, at *4 (D.N.H.

Mar. 18, 2014); see also Forta Corp. v. Surface-Tech, LLC, No. 13-1608, 2015 WL 3756187, at *1 (W.D. Pa. June 11, 2015) (“[T]he Federal Circuit’s statements that indefiniteness is intertwined with claim construction mean only that the Court must attempt to determine what a claim means before it can determine whether the claim is invalid for indefiniteness, and not that the Court must determine indefiniteness during the claim construction proceedings.”).

Where there are competing expert opinions on the issue of indefiniteness, it may not be proper for the court to resolve that issue at the claim construction phase. See Koninklijke Philips Electronics, N.V. v. Zoll Medical Corp., 914 F. Supp. 2d 89, 101 (D. Mass. 2012) (“This ‘battle of the experts’ is not, therefore properly decided at the claim construction phase.”), aff’d, 656 F. App’x 504 (Fed. Cir. 2016); see also Lifescan Scotland, Ltd. v. Shasta Techs., LLC, No. 11-cv-04494, 2014 WL 11206411, at *3 (N.D. Cal. Nov. 10, 2014) (“[W]here extrinsic evidence of the perspective of someone skilled in the art is relevant to the indefiniteness inquiry, it is appropriate to defer the indefiniteness determination until after the close of discovery.”).

Given the issue of fact concerning the parties’ experts underlying any legal determination of invalidity this court may

reach, this court will defer the indefiniteness determination until after a fuller factual record has been developed, whether at summary judgment or a different stage of litigation. Defendant may reassert its indefiniteness arguments at that later stage as appropriate. Assuming arguendo that this court subsequently finds the disputed claim terms here are sufficiently definite, this court will also find that no construction is necessary for those claim terms, as Defendant does not propose an alternative construction of the terms, but merely asserts the terms are indefinite. Therefore, at this stage, the court assumes without deciding that the claim terms are definite, and no construction is necessary.

IV. CONCLUSION

For the foregoing reasons, this court will defer consideration of Defendant's indefiniteness argument as it relates to the two claim terms listed below following the conclusion of fact and expert discovery.

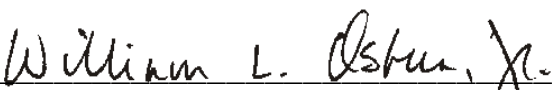
Claim Term	Plaintiff's Construction	Defendant's Construction
"the JFET region having a width less than about three micrometers" (Claim 9)	No construction necessary	Indefinite
"the JFET region having a width of about one micrometer" (Claim	No construction necessary	Indefinite

10, depends from Claim 9)		
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The court assumes without deciding that the claim terms are definite and no construction is necessary at this stage.

IT IS SO ORDERED.

This the 19th day of March, 2024.


United States District Judge